LBNL-52602

Chemical Vapor Deposition of Diamond on High Aspect Vias

O. R. Monteiro[(1)] , G. Bhimarasetti[(2)] and M. K. Sunkara[(3)]
[1]*Lawrence Berkeley National Laboratory, University of California, Berkeley, CA USA;*
[2]*University of Louisville, Louisville, KY USA*
ormonteiro@lbl.gov

Due to its superior mechanical and tribological properties, CVD diamond has been gaining increasing acceptance as a material to be used in microelectro-mechanical (MEMS) components. Typical technology for fabricating such components involves the use of Si-molds, which are filled with CVD diamond. The geometry of the molds has an important effect on the concentration of the chemical species participating in the diamond growth. In this paper we analyze a process that allows growth of diamond in vias with high aspect ratio by controlling the nucleation sites and the gas phase composition. 2 μm-deep vias with opening diameter of 0.3 μm were used in these experiments. A tetragonal amorphous carbon (*ta*-C) deposited at the bottom of the vias was used for enhancing the nucleation density. A mathematical model considering gas-phase and surface reactions was developed and used to establish the process conditions to favour growth from the bottom of the vias up. Microstructure of the diamond plugs was characterized by transmission and scanning electron microscopy. The mold-diamond interface is also characterized, and the effectiveness of the process for filling vias with high aspect ratio is discussed.

Keywords: Diamond deposition; gas phase kinectics; ta-C;